SAFETY VEHICLE HEADREST COVER

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to vehicle headrest covers, and in particular, it concerns a retrofit safety vehicle headrest cover for whiplash protection.

One of the leading causes of injury arising from motor vehicle collisions is whiplash. Whiplash, which occurs most often as a result of rear collision, arises from the violent rearward displacement and rotation of the head of the driver and/or passengers, hereinafter referred to as "passenger," when the car is struck from behind. This rotation and displacement can lead to nerve and muscle damage.

The vast numbers of automobiles manufactured at present include a headrest that is intended to reduce or eliminate the adverse effects of whiplash by arresting the rearward displacement and rotation of the head. Some cars have seats which contain an integrally formed headrest while the vast majority have a headrest which is suitably connected to the seat and whose height is usually adjustable to accommodate passengers of various heights.

It has recently been recognized by various governmental and other safety agencies that most of the presently available headrests are somewhat deficient, in that the protection they offer is only partial. Specifically, it has been determined that for the headrests to be optimally effective, the distance between the forward portion of the headrest and the rear of the passengers head should be less than in that provided by most of the current headrest designs.

It is anticipated that many car manufacturers will introduce, over the coming years, better headrest designs that considerably shorten the distance between the passenger's head and the front surface of the headrest. In the meantime, there are millions of automobiles in use which feature a far less than optimal headrest design, wherein the distance between the headrest and the passenger's head is much too large to provide adequate protection against whiplash.

There is therefore a need for a retrofit safety vehicle headrest cover for whiplash protection that will easily, rapidly and inexpensively convert a conventional headrest into a much safer headrest by effectively reducing the distance between due passengers

head and the front surface of the headrest. It will be of benefit of the headrest were to be adjustable so as to accommodate passengers of different sizes.

SUMMARY OF THE INVENTION

The present invention is a retrofit safety vehicle headrest cover for whiplash protection.

According to the teachings of the present invention there is provided, a headrest cover for whiplash protection of the head of a passenger in the seat having a headrest, the headrest cover comprising: a) a sleeve configured to substantially encase the headrest; b) a compartment associated with the sleeve, the compartment extending outwardly from a front surface of the headrest toward a region of normal head position the head of the passenger; and c) at least one shock-absorbing cushion deployed within the compartment and configured to substantially fill a volume defined by the compartment.

According to a further teaching of the present invention, the sleeve is configured from substantially flexible material.

According to a further teaching of the present invention, the sleeve is configured from substantially rigid material.

According to a further teaching of the present invention, the compartment is permanently connected to the sleeve.

According to a further teaching of the present invention, the compartment is accessible from inside the sleeve.

According to a further teaching of the present invention, the compartment is accessible from outside the sleeve.

According to a further teaching of the present invention, the compartment is detachably connected to the sleeve.

According to a further teaching of the present invention, the at least one shock-absorbing cushion is implemented as a plurality of shock-absorbing cushions.

According to a further teaching of the present invention, at least one of the plurality of shock-absorbing cushions has shock-absorbing properties that are different from the others of the plurality of shock-absorbing cushions.

According to a further teaching of the present invention, at least one of the plurality of shock-absorbing cushions has a shape that is different from the others of the plurality of shock-absorbing cushions so as to configure the overall shape of the plurality of shock-absorbing cushions to substantially fill a volume defined by the compartment.

According to a further teaching of the present invention, the compartment is configured from resilient material so as to conform to an overall shape of the plurality of shock-absorbing cushions thereby accommodating a varying number the shock-absorbing cushions, and the number of shock-absorbing cushions is varied to accommodate whiplash protection requirements of the passenger.

There is also provided according to the teachings of the present invention, a headrest cover for whiplash protection of the head of a passenger in the seat having a headrest, the headrest cover comprising: a) a compartment extending outwardly from a front surface of the headrest toward a region of normal head position the head of the passenger; b) an attachment system associated with the compartment, the attachment system configured to attach the compartment to the headrest; and c) a plurality of shock-absorbing cushions deployed within the compartment and configured to substantially fill a volume defined by the compartment.

According to a further teaching of the present invention, the attachment system is a sleeve configured to substantially encase the headrest.

According to a further teaching of the present invention, the compartment is permanently connected to the attachment system.

According to a further teaching of the present invention, the compartment is accessible from inside the attachment system.

According to a further teaching of the present invention, the compartment is accessible from outside the attachment system.

According to a further teaching of the present invention, the compartment is detachably connected to the attachment system.

According to a further teaching of the present invention, at least one of the plurality of shock-absorbing cushions has shock-absorbing properties that are different from the others of the plurality of shock-absorbing cushions.

According to a further teaching of the present invention, at least one of the plurality of shock-absorbing cushions has a shape that is different from the others of the plurality of shock-absorbing cushions so as to configure the overall shape of the plurality of shock-absorbing cushions to substantially fill a volume defined by the compartment.

According to a further teaching of the present invention, the compartment is configured from resilient material so as to conform to an overall shape of the plurality of shock-absorbing cushions thereby accommodating a varying number the shock-absorbing cushions, and the number of shock-absorbing cushions is varied to accommodate whiplash protection requirements of the passenger.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a perspective view of a headrest cover constructed and operative according to the teachings of the present invention, shown here before deployment over the headrest of a vehicle;

FIG. 2 is a perspective view of a first preferred embodiment of a headrest cover constructed and operative according to the teachings of the present invention, deployed on a headrest that is integrally formed with the seat back;

FIG. 3 is a perspective view of a second preferred embodiment of a headrest cover constructed and operative according to the teachings of the present invention, deployed on a headrest that is formed separate from the seat back;

FIG. 4 is a side elevation of the embodiment of FIG. 3;

FIG. 5 is a side elevation of the embodiment of FIG. 3 deployed on a variant headrest that tilts forward at the top;

FIG.6 is a cross-sectional view of the embodiment of FIG. 4, configured with the compartment accessible form inside the sleeve;

FIG. 7 is a cross-sectional view of the embodiment of FIG. 5, configured with the compartment accessible form inside the sleeve;

FIG. 8 is a cross-sectional view of the embodiment of FIG. 4, configured with the compartment accessible form outside the sleeve;

FIG. 9 is a side elevation of a third preferred embodiment of a headrest cover constructed and operative according to the teachings of the present invention, in which the compartment is detachably connected to the sleeve;

FIG. 10 is graphs of crash test results using the headrest cover of the present invention; and

FIG. 11 is graphs of test results of the same crash test without the headrest cover of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a retrofit safety vehicle headrest cover for whiplash protection.

The principles and operation of vehicle headrest cover according to the present invention may be better understood with reference to the drawings and the accompanying description.

By way of introduction, the headrest cover of the present invention can be viewed as an attachment system, referred to herein as a sleeve **2**, that can be draped over the conventional headrest of a vehicle seat back. Preferably, the sleeve encloses part, or all, of the headrest. Preferably, the bottom portion of the cover includes an attachment element, such as but not limited to elastic, hook and loop fasteners, and a tie cord or string, configured to secure the headrest cover to the headrest so as to prevent its inadvertent removal from the headrest.

Preferably, the sleeve **2** is constructed of a resilient material such as Lycra ®, however, any convenient material such as, but not limited to, cotton, wool, polyester, leather, plastic, vinyl, natural and synthetic materials, may be used. The colors and texture of the cover can be chosen to enhance the aesthetics of the vehicle. Alternatively, the sleeve portion **2** of the headrest cover may be configured from substantially rigid material such as, but not limited to, molded plastic, and polymers and the compartment **4** in which the shock-absorbing cushions are deployed may be configured from the above-mentioned resilient material.

The main function of the headrest cover of the present invention is to enhance the safety of the passenger by shortening the distance between the back of the passenger's

head and the front surface of the headrest. To this end, the front portion of the headrest cover includes a shock-absorbing cushion **6** that extends outwardly from the front surface of the vehicle headrest toward the region of the normal head position of the passenger. Preferably, the shock-absorbing cushion **6** is configured as an interchangeable pad enclosed in a compartment **4** that allows access to the shock-absorbing cushion **6**. Preferably, the compartment **4** is permanently connect to, or configured as part of, the sleeve **2**. Alternately, the compartment **4** may be detachably connected to the sleeve **2**, see Figure 9. In such an embodiment, connection of the compartment **4** to the sleeve **2** may be achieved by using an attachment mechanism **18** such as, but not limited to, hook and loop fasteners, zippers, string ties, laces, and snaps. It should be noted that in a minimal embodiment of the present invention, the compartment **4** may be held in place on the headrest by a variety of attachment systems, other than the sleeve, that will keep the compartment **4** securely in place such as, but not limited to, a sleeve minimally covers the headrest, straps, and direct attachment to the headrest.

Preferably, the compartment **4** is configured so as to accommodate at least one, and preferably several, suitable shock-absorbing cushions **6**. As illustrated in Figures 6-8, the shock-absorbing cushions **6** are preferably arrayed substantially vertically within the compartment **4**. The shock-absorbing cushions are preferably substantially planar sponges; however, substantially any suitable shock-absorbing material may be used.

The thickness, number and shock-absorbing properties of each of the shock-absorbing cushions will determine the amount of forward extension of the compartment toward the back of the head of the passenger. The user is free to select the number and type of shock-absorbing cushions that will give the optimal distance between his/her head and the headrest. This will vary from passenger to passenger due to variations in height and the way he/she holds his/her shoulders and head while seated in the vehicle. It should be noted that the use of the headrest cover of the present invention may also add to the overall comfort of the passenger while riding in the vehicle.

The properties, such as but not limited to, hardness, thickness, and shape, of the shock-absorbing cushions may he selected so as to provide whiplash protection well suited for any given passenger. Preferably, the headrest cover of the present invention is

provided with a selection of shock-absorbing cushions having a variety of characteristics so as to provide a product that is versatile, may be easily customized to the needs of substantially any passenger and is easy to use.

A non-limiting example of customization possibilities may include, the forward-most layer being made of a relatively soft material to increase the passenger's comfort while the layers more to the rear are made of significantly harder shock-absorbing materials so as to absorb the impact and effectively stop the passenger's head from displacing and rotating backward more than a safe amount.

Referring now to the drawings, the shared structural elements of the embodiments described herein are numbered the same for ease of discussion.

Figure 1 illustrates the headrest cover of the present invention before deployment over the headrest of a vehicle. As seen here, the compartment **4** is attached to a loose hanging sleeve **2** that may be stretched over the headrest of the vehicle when deployed.

Figure 2 illustrates a headrest cover **10** that is configured with a sleeve **2** that fits over a headrest that is integrally formed with the seat back. Extending outwardly in a forward direction is the compartment **4**.

Figures 3-7 illustrate a headrest cover **20** that is configured with a sleeve **2** that fits over a headrest that is formed separately from the seat back. Extending outwardly in a forward direction is the compartment **4**. The variation of Figure 5 is due to the orientation of the headrest to the seat back. Here the headrest is illustrated such that the top of the headrest is tilted forward. In such a case, the shock-absorbing cushion of the present invention may be shaped to accommodate such an orientation, as will be discussed with regard to Figure 7.

Figures 6 and 7 illustrate a compartment **4** that is accessible from inside the sleeve **2**, through opening 12. Figure 6 further illustrates the feature of implementing the shock-absorbing cushion as a plurality of shock-absorbing cushions **6a**, **6b**, **6c** and **6d**. Each of the shock-absorbing cushions **6a**, **6b**, **6c** and **6d** may have different characteristics such as, but not limited to, thickness, shape and shock-absorbing properties, so as to provide the require whiplash protection. Figure 7 further illustrates the inclusion of a shock-absorbing cushion **6f** having a shape that is different form the others of the plurality of shock-absorbing cushions **6a** and **6b**. It will be noticed that the

plurality of shock-absorbing cushions substantially fill the volume defined by the compartment **4**. It is preferable that the compartment be configured from material that is expandable so as to conform the size, shape and number of shock-absorbing cushions inserted.

Figure 8 illustrates a compartment **4** that provides access to the shock-absorbing cushions **6a**, **6b**, and **6c** form outside of the sleeve **2** through opening **14**. It should be noted that openings **12** and **14** may be secured in a closed position by substantially any suitable closure mechanism such as, but not limited to, hook and loop fasteners, zippers, string ties, laces, and snaps.

Figure 9 illustrates a third embodiment of the present invention in which the compartment **4** is detachably connected to the sleeve **2** by any suitable attachment mechanism **18** as discussed above. In such an embodiment, each passenger may configure a compartment **4** that is individually customized to their personal whiplash protection requirements, and then move the compartment **4** whenever they change seats in the vehicle.

Figures 10 and 11 are graphs of crash test results that illustrate the effectiveness of the headrest cover (Whipguard) of the present invention. Following are edited excerpts taken from the MIRA, Ltd. test results.

Test Objective:

To undertake evaluation of the Whipguard whiplash protector to ensure compliance to ECE Regulation 25 and other comparable standards. In addition, two additional tests were performed in order to obtain a comparison to assess the energy dissipation characteristics of the Whipguard when used in conjunction with a standard head restraint system compared to the head restraint system used on its own. Test procedure was as per ECE Regulation 25, Annexe 6, Energy Dissipation, a hemispherical headform of 6.8 kg (relative mass), 165 mm diameter, is impacted perpendicular to the head restraint at a point 65 mm down from its top face at a velocity 24.1 km/h. Deceleration of headform shall not exceed 80 g for more than 3 ms continuous. The surrogate head restraint system used for the comparison analysis is a homologated system that complies with the legislative requirements of ECE 17 Regulation 17.

Test 02:

In this test, the Whipguard was fitted over a surrogate head restraint fitted into a surrogate seat back. The seat back was rigidly affixed to an A-Frame and rotated to replicate a back angle of approximately 23°. The head restraint was impacted at 24.12 km/h at a point in the centre of the head restraint 65 mm down from its top face. The deceleration pulse only achieved a peak G of 31.1 g at a time of 30 ms, with a peak force calculated at 2.1 kN. The total impact occurred over a time period of about 60 ms.

Test 03:

Test 03 was performed to provide a comparison test so that the effectiveness of the Whipguard could be evaluated. This test was an identical set-up to Test 02 with the exception that the Whipguard was removed and the pendulum impacted onto the head restraint directly. Pendulum speed at impact was 24.12 km/h. The deceleration pulse achieved a peak G of 36.2 g at a time of 16 ms, with a peak force of 2.4 kN. The impact occurred over a time period of about 50 ms.

Test Comments:

The Whipguard whiplash protector has successfully complied with the energy dissipation requirements laid down in many international legislative regulations and standards. Since it is used in conjunction with an already compliant system, the Whipguard can only be of benefit to any head restraint system on which it is used. By significantly reducing the occupant head to vehicle head restraint gap and providing a high energy dissipation face, the device tackles two areas that have been highlighted by research institutes, such as Thatcham, as being a major cause of whiplash injuries. The comparison test detailed in Test 02 (Figure 10) and Test 03 (Figure 11) shows the Whipguard device does have a benefit when used with a compliant head restraint system. A reduction of 14% in the peak acceleration was experienced by the headform and this correlated with a 13.5% drop in the peak force. It was also noted that with the device installed the impact time increased by 20%, thus allowing the energy of the impact to be spread over a longer time period, this could lead to a reduction in the severity of any injury. The deceleration pulses recorded from the two tests also showed a slight difference. In Test 03 the peak of the pulse occurs early at about 16 ms and then tails away towards the end, this means that most energy is expelled in the first half of the

total time for the impact. In Test 02, with the Whipguard fitted, the deceleration pulse is a lot more rounded and symmetrical, with the peak G occurring a lot later at 30 ms, this indicates a gradual dissipation of energy during the entire impact period.

It will be appreciated that the above descriptions are intended only to serve as examples and that many other embodiments are possible within the spirit and the scope of the present invention.